

CURRENT TOPICS.

Protection of Silvered Surfaces. F. KOLLMORGAN. (*Journal of the Optical Society of America*, January-March, 1919, p. 16.)—At the commencement of the European war the importation of optical glass stopped completely, and at that time no glass suitable for optical instruments was being manufactured in this country. While it appeared probable that before long the glass industry of the United States would be in a position to turn out the ordinary kinds of optical glass, such as crown and flint, it was doubtful how long it would take before the considerable difficulties attending the manufacture of the more modern varieties of glass, such as the borosilicate crown and baryum crown, would be solved. Being engaged in the manufacture of periscopes for submarines, in which eyepiece reflectors of considerable size are used, the writer foresaw serious trouble unless some reflector could be developed which could take the place of the borosilicate prisms so far employed for that purpose. A plain glass mirror, silvered at the surface, of course, presented the easiest solution provided the surface could be protected efficiently against atmospheric influences. While looking up the subject of the possibility of such protection which, of course, must not, in any way, interfere with the optical efficiency of the mirror, it was found that as late as 1894, Mr. Izarn published in the *Comptes Rendus* a protective coating of bichromated gelatin which he had applied on a 33-centimetre telescope reflector at the Toulouse Observatory. This reflector withstood the influence of sulphuretted hydrogen for twenty-four hours without change. In 1909 Mr. A. Perot described also in *Comptes Rendus* a protective coating consisting of celluloid dissolved in amylacetate. Mr. Louis Bell in the *Electrical World*, 1913, mentions the employment of a commercial lacquer sold under the name of Lastina Lacquer for the same purpose with very good results. It appears that a two-foot parabolic reflector used at the Harvard Observatory protected in this manner, lost only 4 per cent. of its original light transmission through the lacquering, and after three months service still retained 70 per cent. of its original light transmission.

Both Mr. Perot's and Mr. Bell's papers, however, state that the lacquer must be used in a very thin layer and will show interference colors. The first experiments made by the writer produced an efficient protection, but it was found that the interference colors showed plainly when the eyepiece was used on a periscope and this phenomenon had to be overcome. When the coating of lacquer was sufficiently thick to show no interference colors the lacquer dried sometimes in waves and streaks, and sometimes with a crinkly sur-

face seriously damaging the definition of the mirror, and it occurred to the writer that this appearance might be avoided by centrifuging the mirror during the drying so that the surface would be kept under an even tension until dry. An experiment along these lines proved very satisfactory and mirrors protected in this manner have been used since in a large number of periscopes with very good results. Even after a year's use the mirrors have shown no appreciable decrease in efficiency and no appearance of tarnishing whatever. The reflecting power of these mirrors is greater than that of a prism, for in some of our periscopes we have employed a mirror at the top for the high power and a prism for the low power and the increase in light transmission from low to high power has been quite noticeable. Owing to the rush of war work, it has unfortunately been impossible to make exact measurements of the light transmission.

The protection given by the coating of lacquer, is, however, a very slight one against mechanical damage, as the lacquer is very soft and will scratch at the slightest touch. If dust should settle on the mirror it must be removed by means of a very fine camel's-hair brush; a soft piece of chamois leather may be employed if care is taken that it is absolutely free from grit or dust. Attempts to harden the lacquer by baking have not proved successful. Various other lacquers and varnishes that were tried did not give as good optical results as the Lastina lacquer. Mr. Bell's paper suggests that lacquer should be thinned down in proportion of one part lacquer to six parts commercial thinner. We use one part lacquer and two parts thinner with our method.

Electrical Distribution in Mines. E. STECK. (*Coal Age*, vol. xvi, No. 1, July 3, 1919.)—The bituminous mines in the central states have a general practice of connecting the entire electrical distribution system underground to a circuit breaker on the surface. This practice has a number of shortcomings. If the circuit breaker trips all the locomotives, cutting machines and other motors are stopped. As soon as the breaker is put in all the motors are thrown on the line, creating a heavy overload on the power-plant equipment. All the machinery below is idle while the circuit breakers are out.

When heavy grounds occur there is no indication of their location. The entire mine is idle until the trouble is found and that section in which the short has occurred is cut off, or the trouble remedied.

By the use of circuit breakers underground trouble can be located much quicker. Only a small portion of the mine will be idle at such times and the starting over-load on the plant will be greatly reduced. Take, for example, a mine having two main entries: A switchboard panel can be placed on the bottom with two circuit breakers and switches, each controlling one-half of the mine. The lights on the bottom can be connected in behind